

UNI-PULSE

Defibrillator Analyser



Rigel Uni-Pulse

Defibrillator Analyser

Instruction Manual

386A550 Issue 1.1

October 2013

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Issue 1.1

Rigel Medical 24 Month Warranty Statement

Rigel Medical provides a standard 12-month manufacturer's warranty against breakdown during normal use. This warranty can be upgraded to a 24-month warranty (terms and conditions apply*). Problems caused through misuse, damage, fair wear & tear, consumables and accessories are excluded from standard warranty. Such components found to be being used in excess of their manufacturer's operating recommendations are also excluded. Shipping to an authorised service centre is the responsibility of the sender.

***Terms and Conditions of 24 Month Warranty**

The Rigel product must be registered with Rigel Medical within 30 days of purchase to be eligible for the extended 24-month warranty. Instruments must be returned to an authorised service centre complete with proof of purchase within 13 months of purchase for calibration at the current rate. Any items returned for calibration outside of the 13 month period stated above may not be eligible for the second 12 month section of warranty. The second 12 month section of the warranty begins at the expiry of the initial 12 month period, not when the unit is calibrated.

Details correct at time of going to print. The manufacturer retains the right to make amendments to the above terms and conditions without prior notice.

Calibration Statement

The Rigel Uni-Pulse Defibrillator Analyser is fully calibrated and found to be within the specified performance and accuracy at the time of production. The Seaward Group provides its products through a variety of channels; therefore it may be possible that the calibration date on the provided certificate may not represent the actual date of first use.

Experience has indicated that the calibration of this instrument is not effected by storage prior to receipt by the user. We therefore recommend that the recalibration period be based on a 12 month interval from the first date the unit is placed in to service.

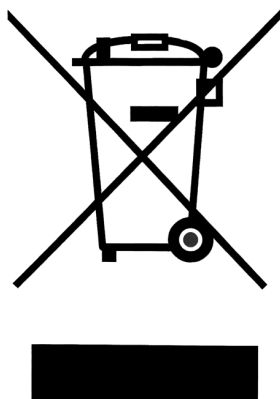
Date received into service; ____ / ____ / ____.

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All rights reserved. Nothing from this edition may be multiplied, or made public in any form or manner, either electronically, mechanically, by photocopying, recording, or in any manner, without prior written consent from the SEAWARD GROUP. This also applies to accompanying drawings and diagrams.

Due to a policy of continuous development the SEAWARD GROUP reserves the right to alter the equipment specification and description outlined in this publication without prior notice and no part of this publication shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.

Disposal of old product



The Rigel Uni-Pulse has been designed and manufactured with high quality materials and components, which can be recycled and reused.

When this symbol is attached to a product it means the product is covered by the European Directive 2012/96/EC.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products or contact your local supplier for further information.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. By offering your old products for recycling, you will help prevent potential negative consequences for the environment and human health.

Certificate of Conformity

Manufactured by:

Seaward Electronic Ltd, Bracken Hill, South West Industrial Estate
Peterlee, County Durham, SR8 2SW, England

Statement of Conformity

As the manufacturer of the apparatus listed, declare under our sole responsibility that the product:

Rigel Uni-Pulse Defibrillator Analyser

To which the declaration relates are in conformity with the relevant clauses of the following standard(s):

BS EN 60601-1:2005

Medical electrical equipment - Part 1: General requirements for basic safety and essential performance.

BS EN 61010-1:2010

Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.

BS EN 61326:2006

Electrical equipment for measurement, control, and laboratory use - EMC requirements.

CISPR 11, Ed. 4.1. (2004-06)

Performance: The instrument operates within specification when used under the conditions in the above standards EMC and Safety Standards.

The product identified above conforms to the requirements of Council Directive 2004/108/EC and 2006/95/EC.

This Conformity is indicated by the symbol , i.e. “Conformité Européenne”

Seaward Electronic Ltd. is registered under BS EN ISO9001:2000 Certificate No.: Q05356.

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1. Introduction

1.1. Design Philosophy

The Rigel Uni-Pulse is a portable and battery operated defibrillator analyser, designed to safely test the performance of all mono and bi-phasic, standard and pulsating waveforms and AED applications. Control of the Rigel Uni-Pulse is through a menu driven colour graphic user interface (GUI).

1.2. Unpacking the Uni-Pulse

Carefully unpack all items from the box and ensure the following items are included:

- Rigel Uni-Pulse Defibrillator Analyser
- AC Power Supply
- ECG Snap Adapters (pack of 10)
- Uni-Pulse Quick Start Guide
- Utilities Disc
- Carry Case
- USB Bluetooth Adapter

2. Warnings and Cautions

2.1. User Notes

The following symbols are used throughout this Instruction Manual.



Warning of electrical danger!
Indicates instructions must be followed to avoid danger to persons.



Important, follow the documentation! This symbol indicates that the operating instructions must be adhered to in order to avoid danger.

2.2. Safety Notes



Users - The Rigel Uni-Pulse Defibrillator Analyser is designed for use by adequately trained technical personnel only.



Operation - The Rigel Uni-Pulse Defibrillator Analyser is designed for use within the published specifications. Any application outside of these specifications or any unauthorised user modifications may result in hazardous conditions or improper operation.



Operation - The Rigel Uni-Pulse Defibrillator Analyser is designed for use with Defibrillators and Automated External Defibrillators (AED's) only.



Operation - Refer to the Device Under Test (DUT) manufacturer operating instructions to ensure safe operation whilst analysing the DUT.



Safety - Ensure that only accessories supplied by the manufacturer or accessories that meet the manufacturer's specification are used.



Safety - Use extreme caution when working with voltages greater than 30 Volts.



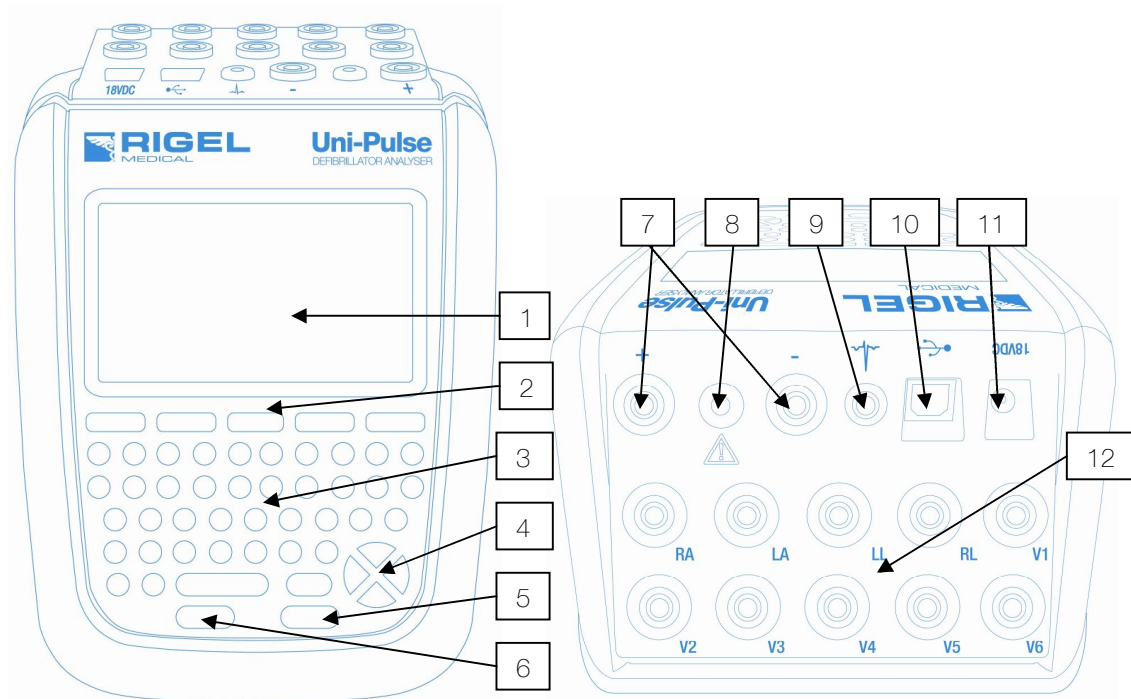
Safety - Where safe operation of the Uni-Pulse is no longer possible it should be immediately shut down and secured to prevent accidental operation.

It must be assumed that safe operation is no longer possible:

- if the instrument or leads show any sign of damage or
- the instrument does not function or
- after long periods of storage under adverse environmental conditions.

3. At a Glance

3.1. Uni-Pulse Overview



- 1 Large colour graphic display
- 2 Function keys F1 - F5
- 3 QWERTY keyboard
- 4 Directional navigation keys
- 5 Power ON/Start button
- 6 Power OFF/Stop button
- 7 Defib/paddle adaptor box connection
- 8 Variable load box connection
- 9 ECG-Hi output
- 10 USB connection
- 11 Power supply socket
- 12 10 x ECG connections

3.2. Icons

To make navigating through the options of the Uni-Pulse an easier and more intuitive experience, the traditional menu format has been replaced by a unique set of easily recognisable icons:

	Defibrillator mode		Pulse amplitude		Keyboard entry
	Charge time mode		Pulse frequency		Delete
	Cardiac Synch mode		Heart rate		Search
	AED mode		Start		Edit
	ECG simulation		Confirm		Bluetooth active
	Performance waveform		Back		Print
	Arrhythmia waveform		Scroll up/down		Save
	Pulse width		Scroll left/right		About
	Waveform selection		Variable load selection		Contact details

4. Getting started

4.1. Turning the Uni-Pulse On and Off

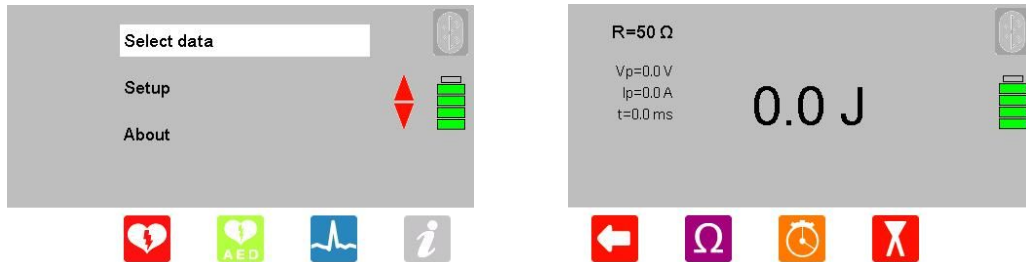
To turn the Uni-Pulse ON, press and hold the green ON key until the Rigel Medical splash screen appears.

To turn the Uni-Pulse OFF, press and hold the red OFF key until power is removed from the unit.

4.2. Accessing the Uni-Pulse Tests

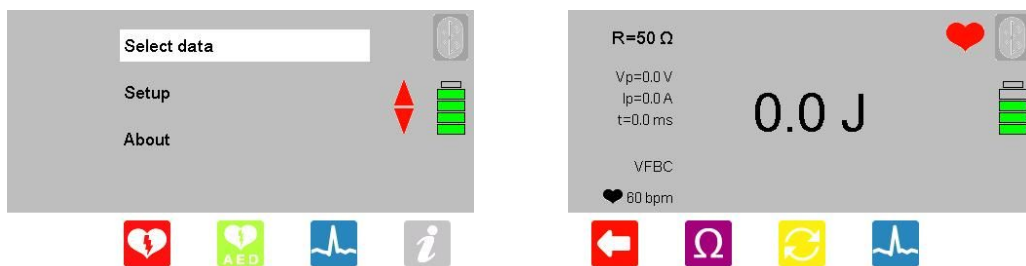
From the main menu you can access the following test menus using the function keys F1-F5:

Defibrillator Mode



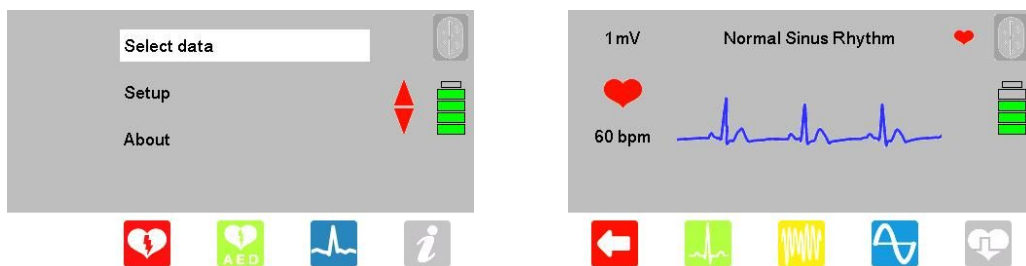
Press  for Defibrillator mode.

Automated External Defibrillator (AED) Mode



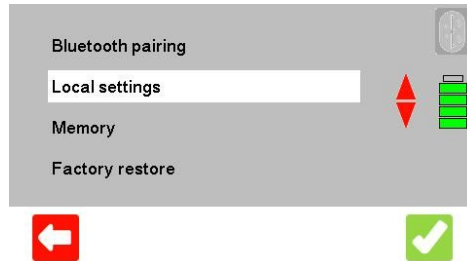
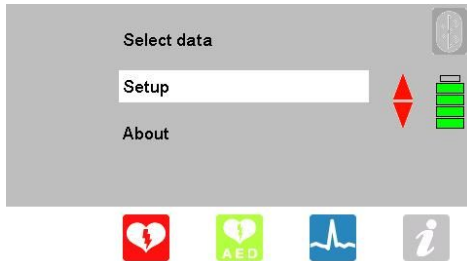
Press  for AED mode.

Electrocardiogram (ECG) Simulation Mode

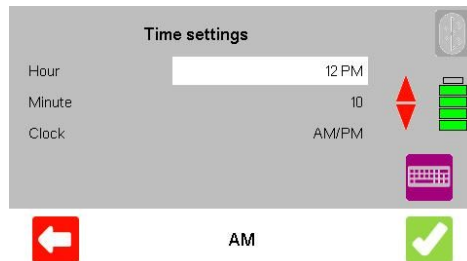
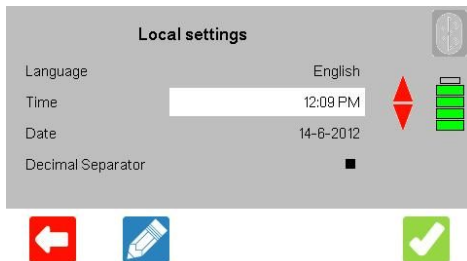


Press  for ECG simulation.

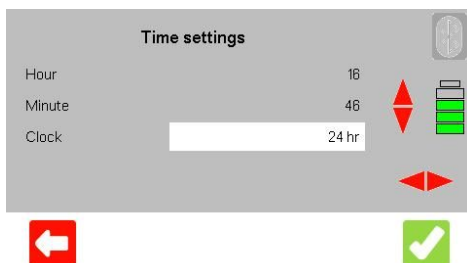
4.3. Setting the Time/Date



From the main menu, use the  arrow keys to highlight Setup and press the  key. Highlight Local settings and press the  key.



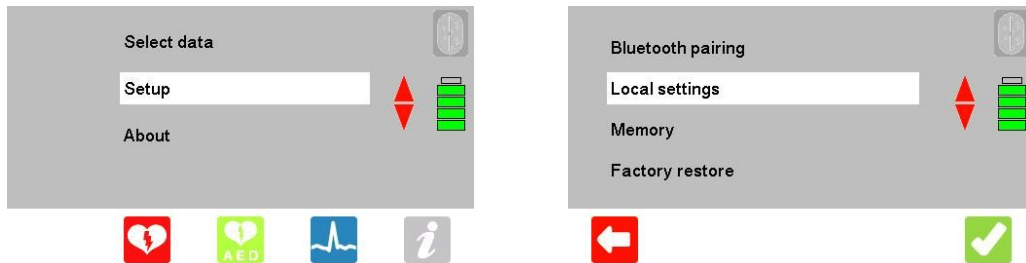
Highlight Time and press  to edit the time settings. Use the keyboard to edit the hour and minute and use **F3** to switch between AM and PM.



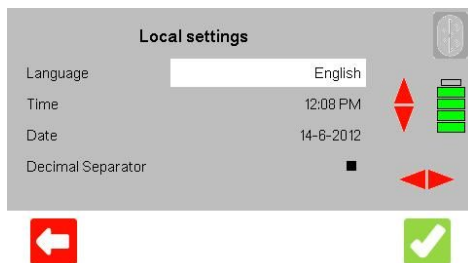
To change between 12/24 Hr clock, scroll down to Clock and use the  arrow keys to change the clock format.

Press  to confirm and save the changes, or  to exit without saving.

4.4. Setting the Language



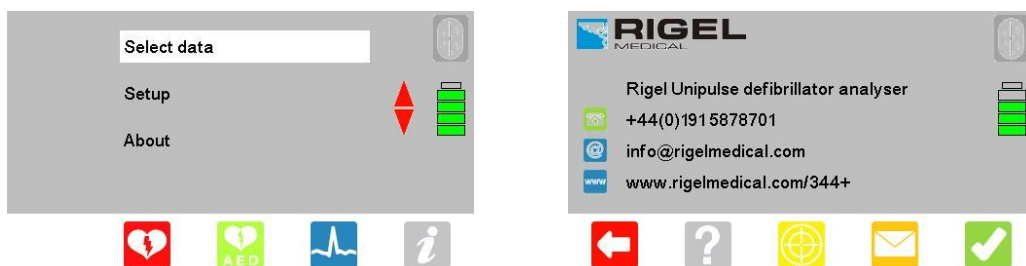
From the main menu, use the  arrow keys to highlight Setup and press the  key. Highlight Local settings and press the  key.



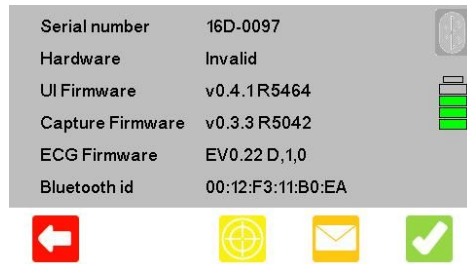
To change the Language, scroll through the available languages using the  arrow keys.

Press  to confirm and save the changes, or  to exit without saving.

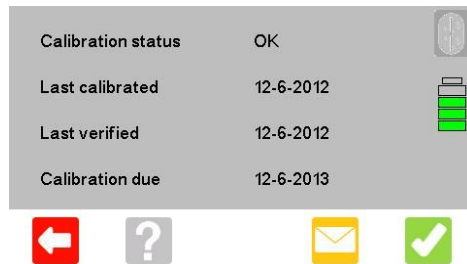
4.5. Displaying Uni-Pulse Information



From the main menu press  to view the unit information, serial no., calibration status and calibration and service contact details.



Press to view the serial no. and hardware/firmware version of the unit.



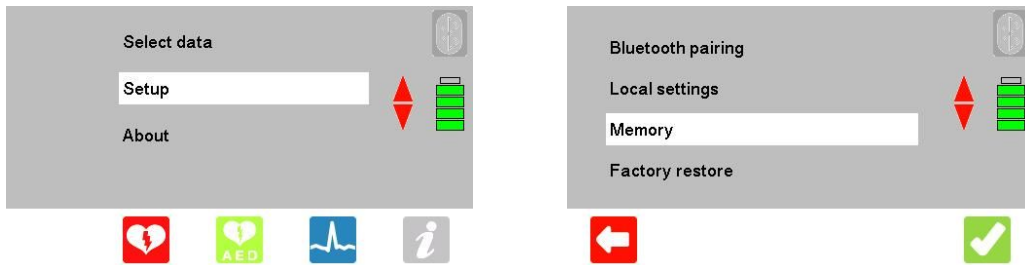
Press to view the calibration status of the unit.



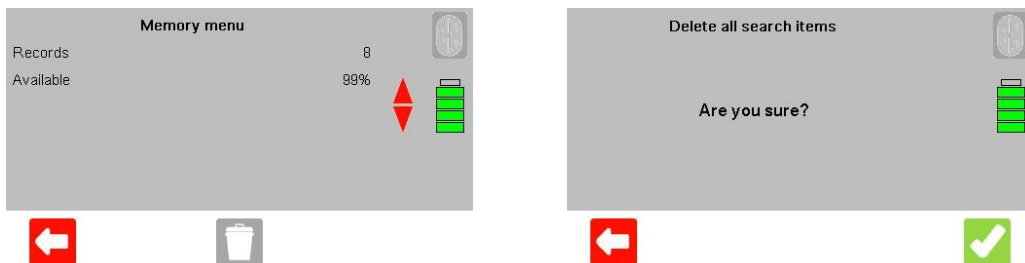
Press to view service and calibration contact information.

Press or to exit and return to the previous menu.

4.6. Clearing the Results Memory

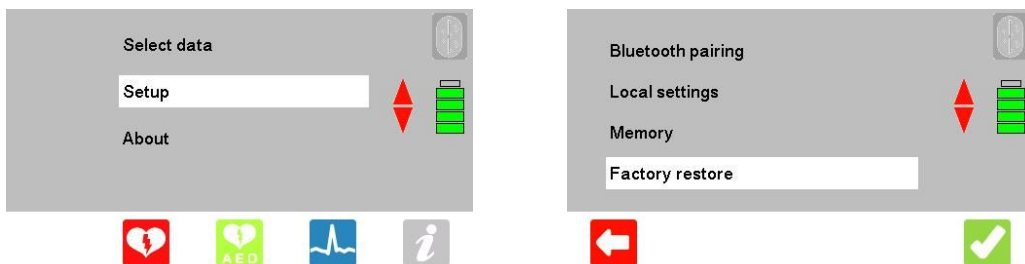


From the main menu, use the  arrow keys to highlight Setup and press the ↵ key. Highlight Memory and press the ↵ key.

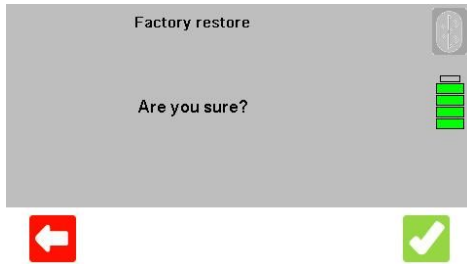


Press  to delete the results memory and press  to confirm.

4.7. Restoring Factory Settings



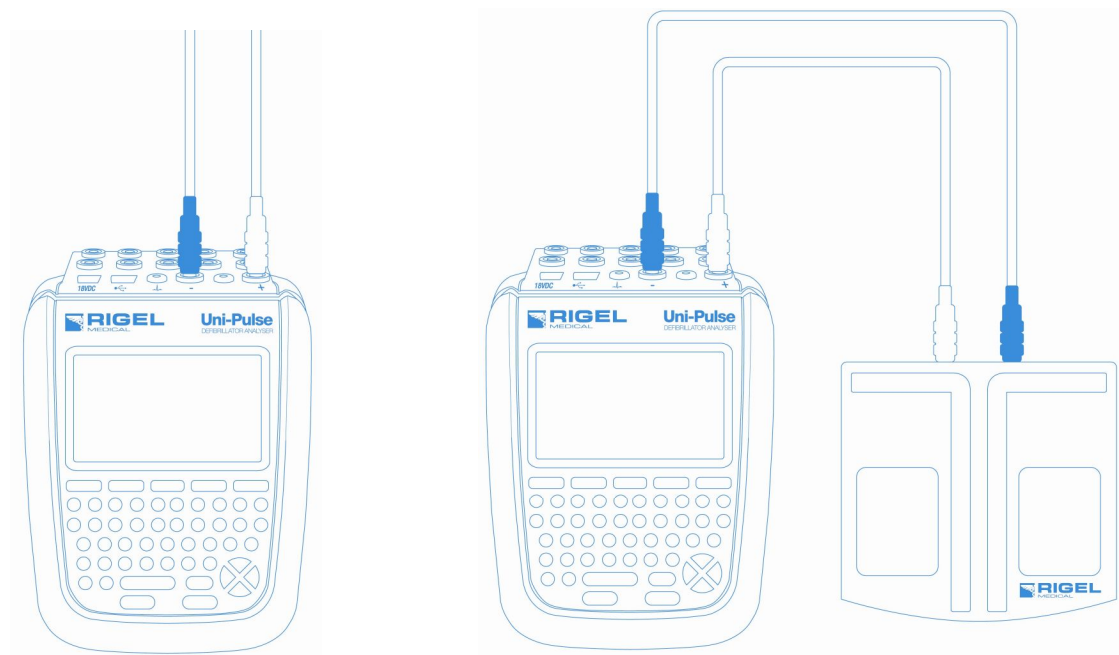
From the main menu, use the  arrow keys to highlight Setup and press the ↵ key. Highlight Factory restore and press the ↵ key.



Press  to restore factory settings.

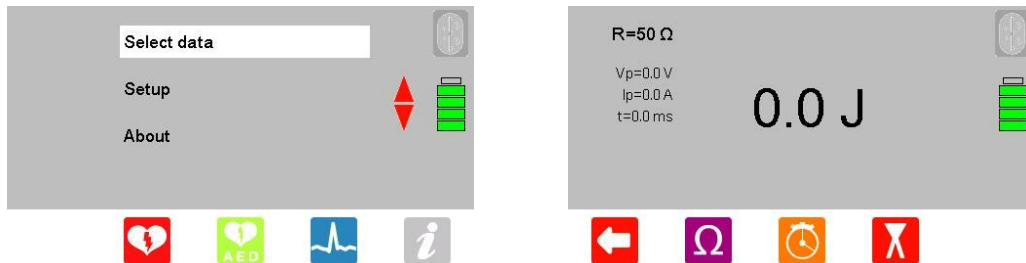
5. Analysing Defibrillators

5.1. Connecting a Defibrillator to the Uni-Pulse



The defibrillator or AED under test can be connected direct to the Uni-Pulse using 4mm connectors, or the paddle adaptor box can be used as shown above.

5.2. Testing Energy Discharge



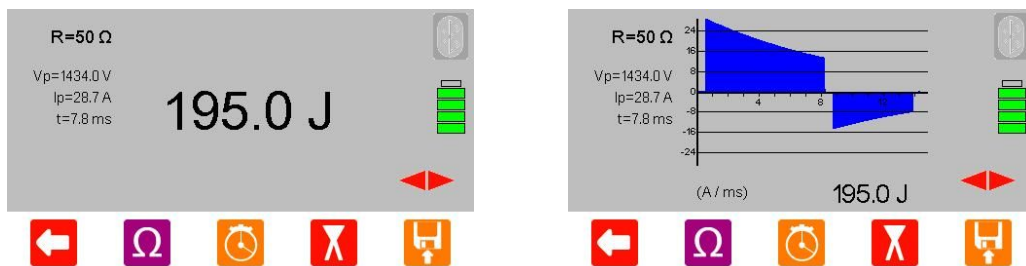
From the main menu press  for Defibrillator mode. The Uni-Pulse is now ready to measure the defibrillator discharge.



Charge the defibrillator. Once the defibrillator is charged, use the **shock/discharge** button to safely deliver the electrical energy into the Uni-Pulse.

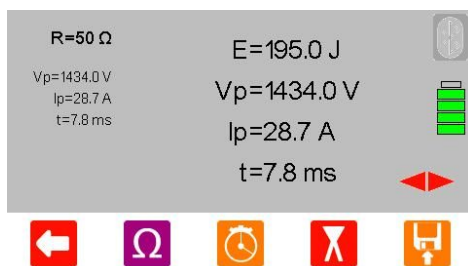


Ensure all safety precautions and safe operating procedures are observed as highlighted in the manufacturer operating instructions for your device.



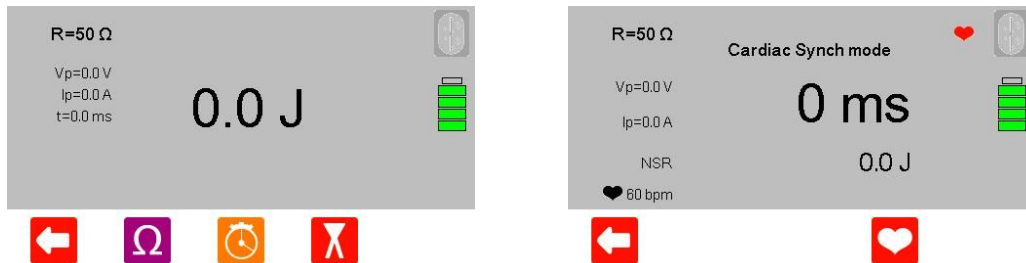
The measured energy will be displayed on the Uni-Pulse screen along with peak voltage, peak current and pulse duration.

Press the  key to view the waveform graph and a measurement summary.



Press  to save the test result or  to exit.

5.3. Testing Cardiac Synchronisation



From the Defibrillator mode menu press  for Cardiac Synch mode. The Uni-Pulse is now ready to measure the cardiac synchronisation time.

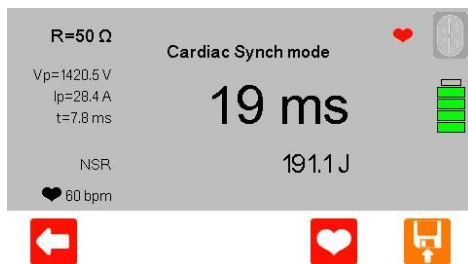
Activate Synchronisation mode on the defibrillator.



Charge the defibrillator. Once the defibrillator is charged, use the **shock/discharge** button to safely deliver the electrical energy into the Uni-Pulse.



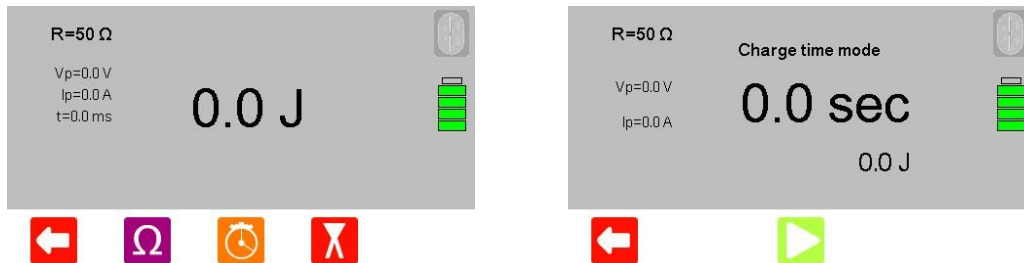
Ensure all safety precautions and safe operating procedures are observed as highlighted in the manufacturer operating instructions for your device.



The cardiac synchronisation time will be displayed on the Uni-Pulse screen along with the measured energy, peak voltage, peak current and pulse duration.

Press  to save the test result or  to exit.

5.4. Testing Charge Time



From the Defibrillator mode menu press  for Charge time mode.

To accurately measure charge time the defibrillator charge must be called for at exactly the same time  is pressed to begin the timer.

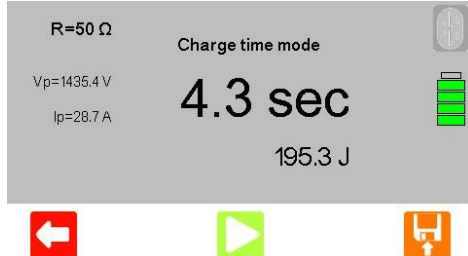


As soon as the defibrillator is charged, use the **shock/discharge** button to safely deliver the electrical energy into the Uni-Pulse.

Once the energy discharge is registered by the Uni-Pulse the timer will stop.



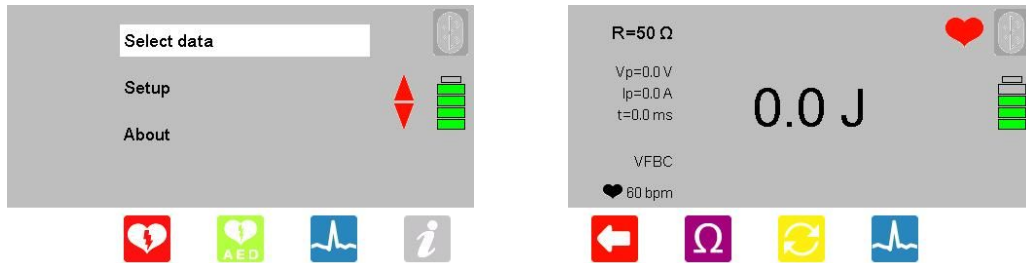
Ensure all safety precautions and safe operating procedures are observed as highlighted in the manufacturer operating instructions for your device.



The charge time will be displayed on the Uni-Pulse screen along with the measured energy, peak voltage, peak current and pulse duration.

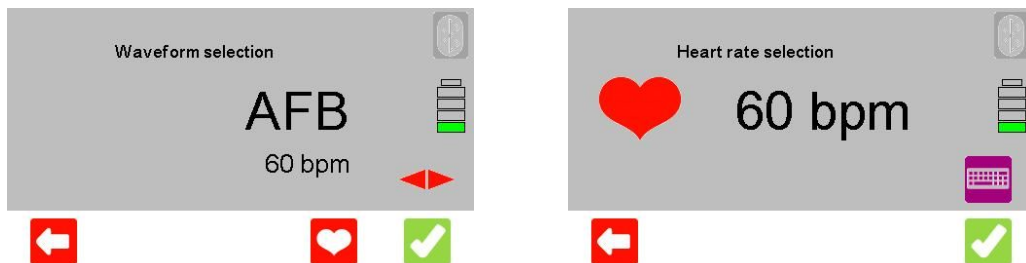
Press  to save the test result or  to exit.

6. Analysing Automated External Defibrillators (AED)



From the main menu press  for AED mode. The Uni-Pulse is now ready to test the function of the AED.

Press  to change the output waveform of the Uni-Pulse.



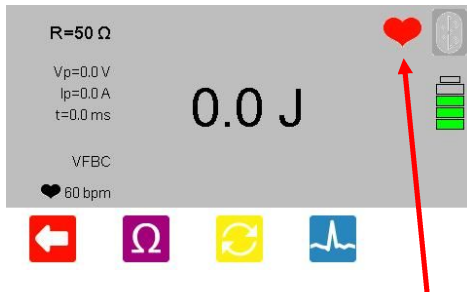
Use the   arrow keys to scroll through the selection of shockable and non-shockable rhythms:

Ventricular Fibrillation Fine (VFBF), shockable
Ventricular Fibrillation Coarse (VFBC), shockable
Polymorphic Ventricular Tachycardia (PVT), shockable.

Normal Sinus Rhythm (NSR), non-shockable
Monomorphic Ventricular Tachycardia (MVT), non-shockable
Atrial Fibrillation (AFB), non-shockable
Asystole (ASYS), non-shockable

Press  to change the heart rate. This is only available for NSR, MVT and AFB. ASYS, VFBF and VFBC are set to a default. Use the keyboard to enter a value between 20 and 300 BPM and press  to confirm.

Press  again to return to the AED menu.



The simulation is active when the red heart symbol is pulsing.

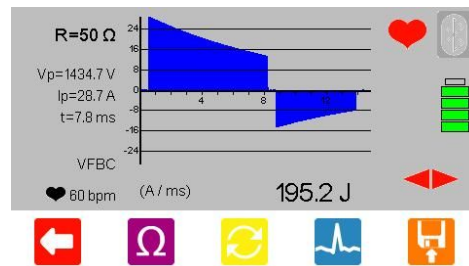
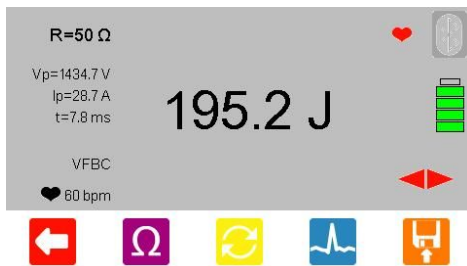
Power on the AED and follow the instructions. The AED will monitor the output rhythm and confirm whether a shock is necessary.



If a shock is advised, use the **shock/discharge** button to safely deliver the electrical energy into the Uni-Pulse.



Ensure all safety precautions and safe operating procedures are observed as highlighted in the manufacturer operating instructions for your device.



The measured energy will be displayed on the Uni-Pulse screen along with peak voltage, peak current and pulse duration.

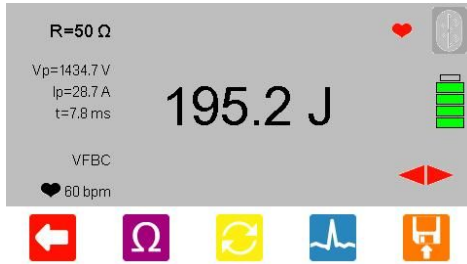
Press the  key to view the waveform graph and a measurement summary.



Press  to save the test result or  to exit.

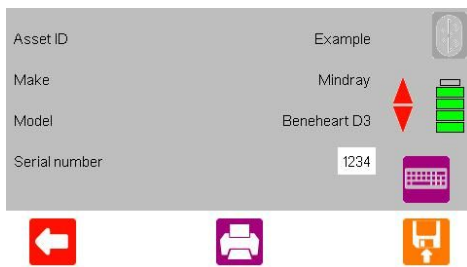
7. Viewing Data

7.1. Saving a Test Result



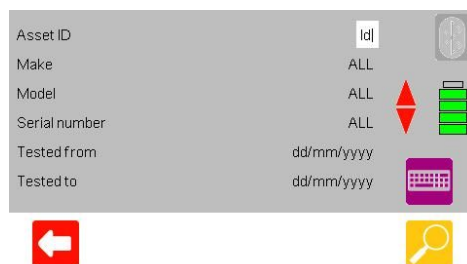
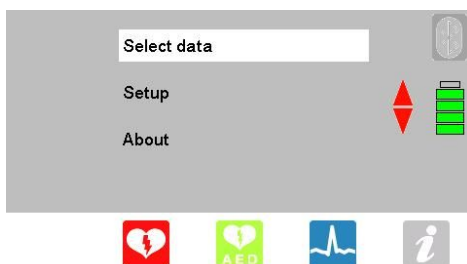
At the end of a test press  to save. Enter the save details using the keyboard or scan the Asset ID using the Bluetooth barcode scanner.

If an item of information has previously been saved, the Uni-Pulse will predict the data entry from the first key presses.



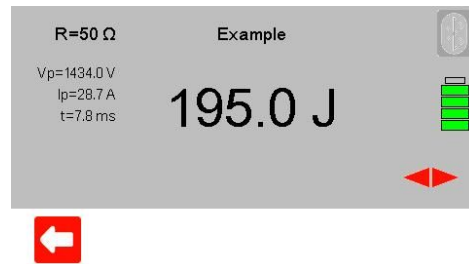
Once all of the information has been entered press  to save. A message will be displayed to confirm the save.

7.2. Viewing a Saved Test Result



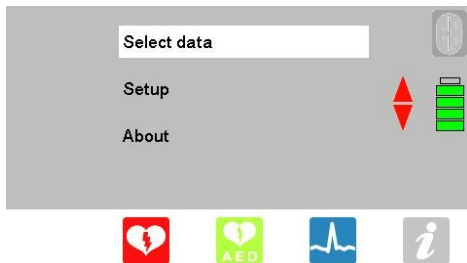
From the main menu, use the  arrow keys to highlight Select data and press the ↵ key.

Enter search criteria using the keyboard or an Asset ID using the Bluetooth barcode scanner on the search screen. Press  to display the results.



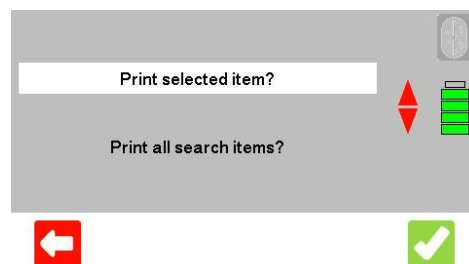
Use the arrow keys to highlight the asset you wish to view and press to view the test result.

7.3. Printing a Saved Test Result



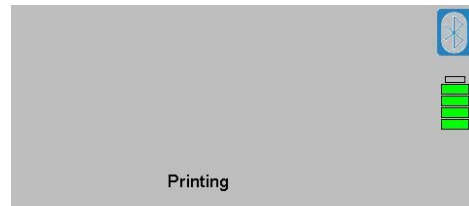
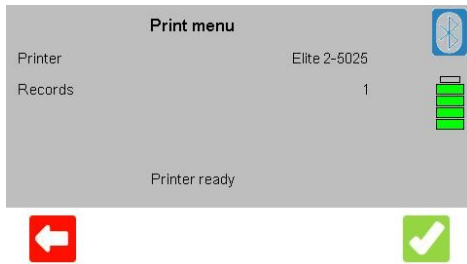
From the main menu, use the arrow keys to highlight Select data and press the $\downarrow$ key.

Enter search criteria using the keyboard or an Asset ID using the Bluetooth barcode scanner on the search screen. Press to display the results.



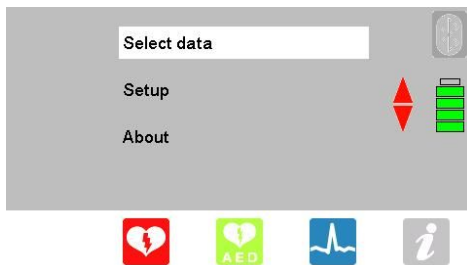
Use the arrow keys to highlight the asset you wish to view and press to either print this test result or to print results for all items in the list.

Press to connect to the printer.



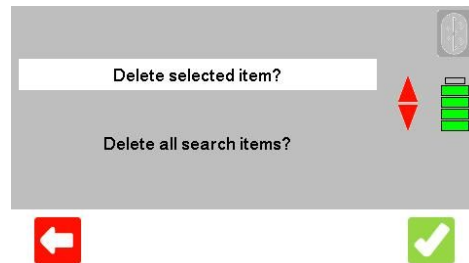
Once the connection is made press  to print.

7.4. Deleting a Saved Test Result



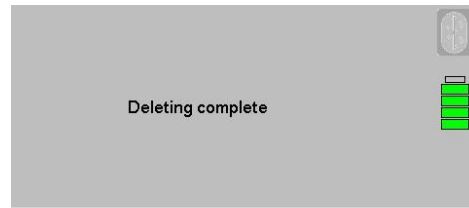
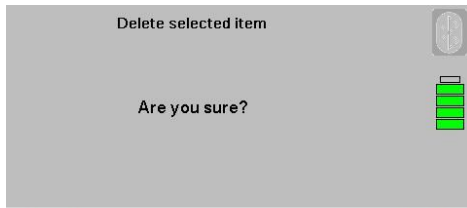
From the main menu, use the  arrow keys to highlight Select data and press the  key.

Enter search criteria using the keyboard or an Asset ID using the Bluetooth barcode scanner on the search screen. Press  to display the results.



Use the  arrow keys to highlight the asset you wish to delete and press  to either delete this test result or to delete all results in the list.

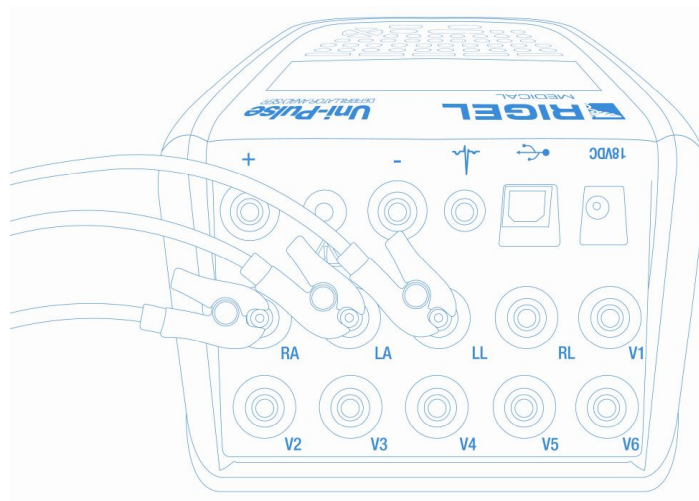
Press  to confirm.



Press  again to confirm or press  to exit.

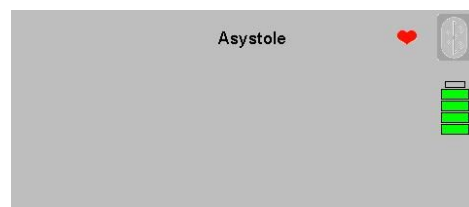
8. Simulating ECG Waveforms

8.1. Connecting ECG leads to the Uni-Pulse

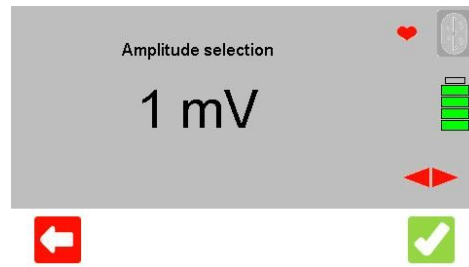
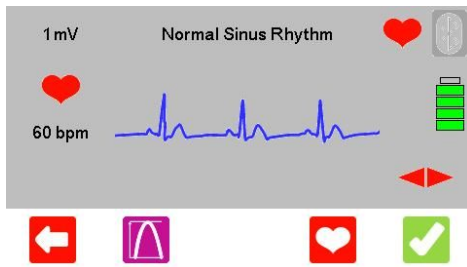


Use the supplied ECG snap connectors to connect ECG leads to the 4mm ECG terminals on the rear of the Uni-Pulse. The ECG connectors are colour coded as per international standards.

8.2. Simulating a Waveform

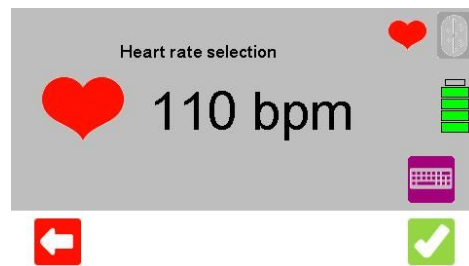
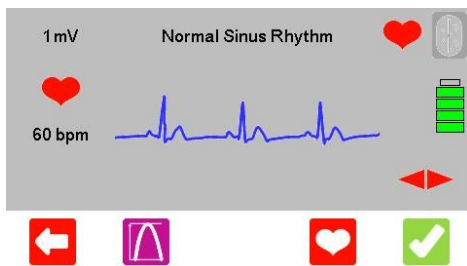


From the main menu press  for ECG simulation then press  for simulation waveforms.

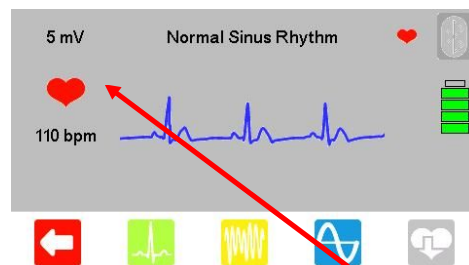
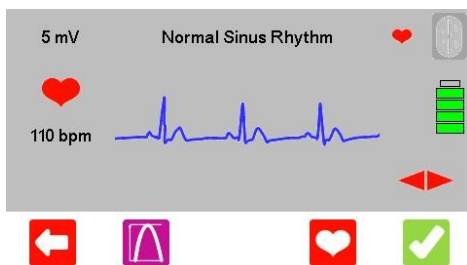


Use the  arrow keys to move between the available simulation waveforms.

Press  to change the Pulse Amplitude to a fixed value of 0.5mV, 1mV, 2mV or 5mV. Press  to confirm or  to exit without saving.



Press  to change the Heart Rate to any value between 20 and 300 BPM. Press  to confirm or  to exit without saving.

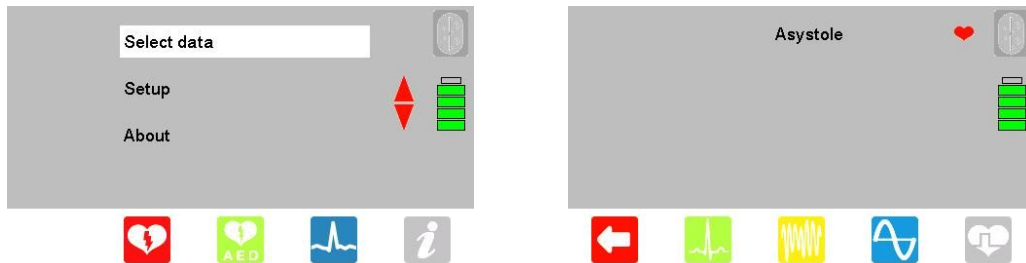


Press  to confirm the simulation settings and begin the new simulation. The new amplitude and heart rate settings can be viewed on the left hand side of the display.

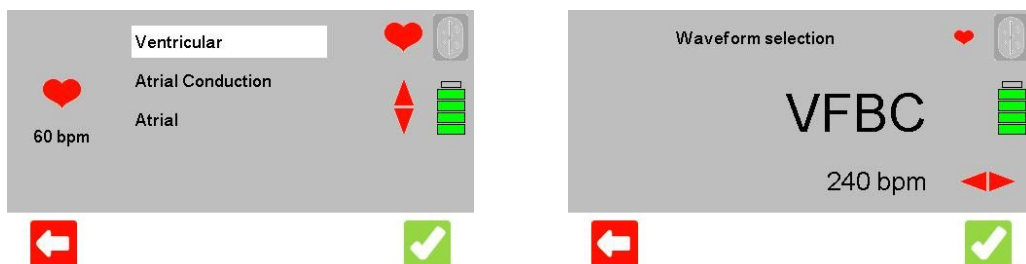
The following simulation waveforms are available:

- Normal Sinus Rhythm (NSR)
- ST Elevation
- ST Depression
- Myocardial Infarction
- Tall T

8.3. Simulating an Arrhythmia Waveform



From the main menu press  for ECG simulation then press  for arrhythmia waveforms.

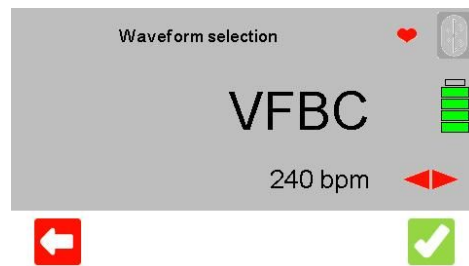


Use the  arrow keys to highlight the required arrhythmia type and press  to enter the sub-menu.

Use the  arrow keys to scroll through the available arrhythmias and press  to confirm or  to exit.

The following arrhythmia waveforms are available:

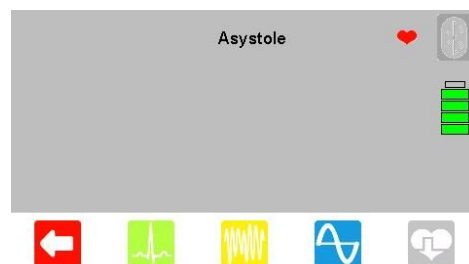
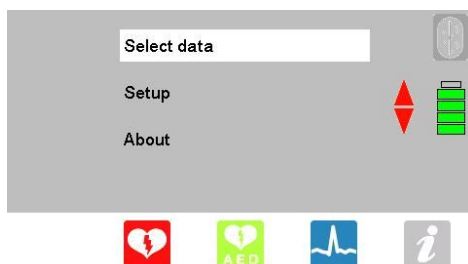
Ventricular	Atrial Conduction	Atrial
Ventricular Fibrillation Coarse (VFBC)	First Degree AV Block (FAVB)	Sinus Arrhythmia (SAR)
Ventricular Fibrillation Fine (VFBF)	Second Degree AV Block Mobitz I (SAVB_MI)	Missing Beat (MB)
Monomorphic Ventricular Tachycardia (MVT)	Second Degree AV Block Mobitz II (SAVB_MII)	Atrial Flutter (AFLT)
Polymorphic Ventricular Tachycardia (PVT)	Third Degree AV Block (TAVB)	Atrial Fibrillation (AFB)
Right Focal Premature Ventricular Contraction (RFPVC)	Right Bundle Branch Block (RBB)	Paroxysmal Atrial Tachycardia (PAT)
Premature Ventricular Contraction Intermittent (PVCi)	Left Bundle Branch Block (LBB)	Junctional Premature Contraction (JPC)
Premature Ventricular Contraction Continuous (PVCC)	Left Anterior Hemiblock (LAH)	
Bigeminy (BIG)		
Trigeminy (TRIG)		
Ventricular Flutter (VFLT)		



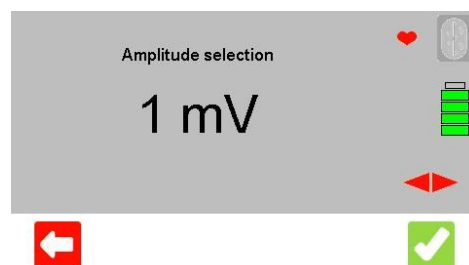
Press  to change the Pulse Amplitude and press  to change the Heart Rate. If either of these options are unavailable, then the selected waveform has a default setting which can not be changed.

Press  to confirm the waveform and  again to begin the simulation.

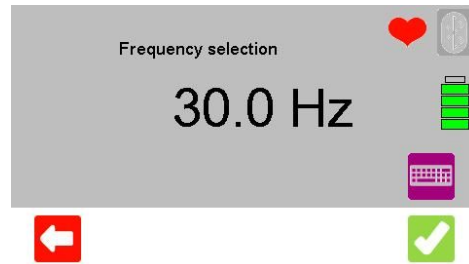
8.4. Simulating a Performance Waveform



From the main menu press  for ECG simulation then press  for performance waveforms.



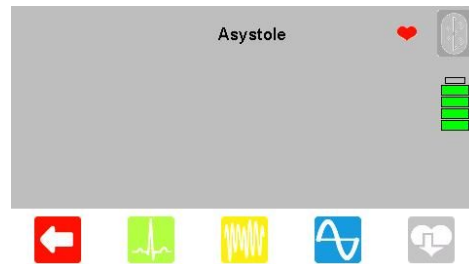
Use the  arrow keys to highlight the required performance waveform. Press  to change the Pulse Amplitude.



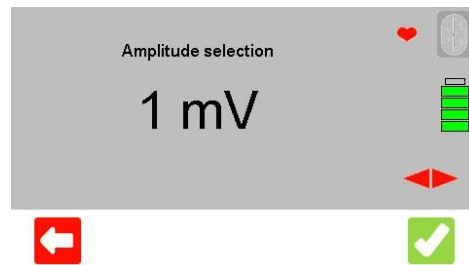
Press **Hz** to change the Pulse Frequency. Pulse frequency can be set to any value between 0.1Hz and 100Hz.

Press to confirm the settings or to exit.

8.5. Simulating a Pacer Waveform



From the main menu press for ECG simulation then press for pacer waveforms.



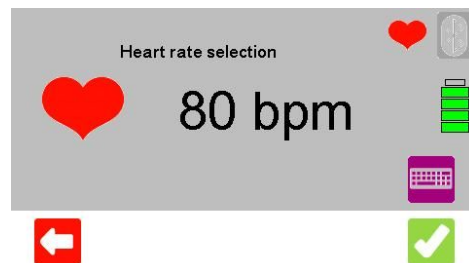
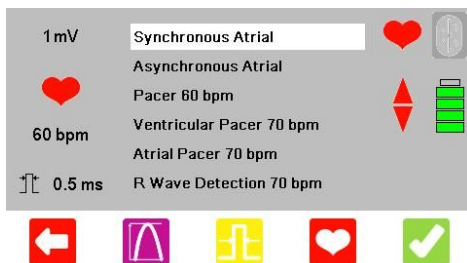
Press to change the Pulse Amplitude.

Press to confirm or to exit.



Press  to change the Pulse Width. Pulse width can be set to any value between 0.1ms and 2ms.

Press  to confirm or  to exit.



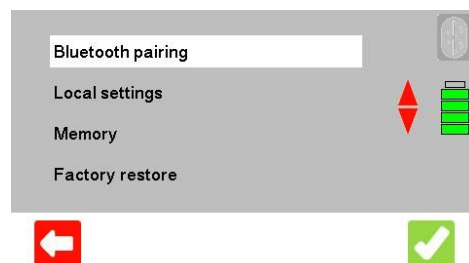
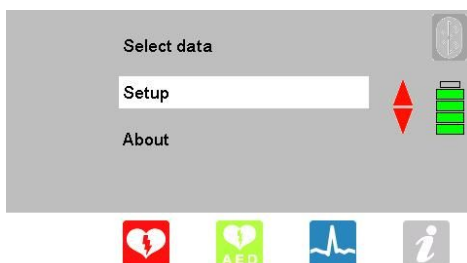
Press  to change the Heart Rate.

This option is only available for Synchronous Atrial and Asynchronous Atrial. The remaining pacer simulations have a set default heart rate.

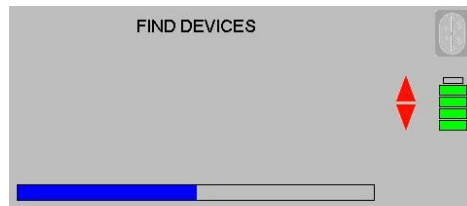
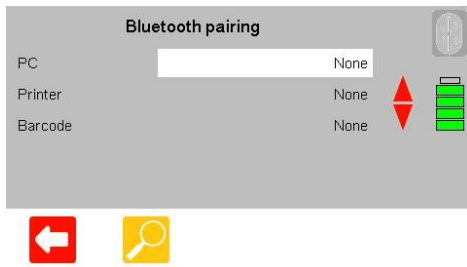
Press  to confirm or  to exit.

9. Connecting to another Device

9.1. Searching for a Bluetooth Device



From the main menu use the  arrow keys to highlight **Setup** and press . Highlight **Bluetooth Pairing** and press . The Uni-Pulse is now ready to search for Bluetooth devices.



Press  to begin searching for Bluetooth devices. A blue progress bar will appear displaying the progress of the search.

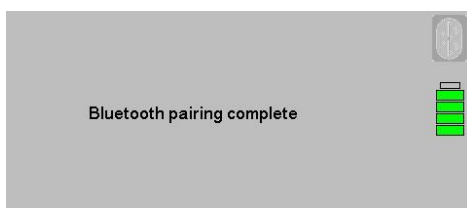
9.2. Connecting to the Test 'n' Tag Elite Printer

Ensure the Test 'n' Tag Elite Printer is switched on. Consult the user manual for this device for instructions.



A list of available Bluetooth devices will be displayed once searching is complete. Use the  arrow keys to scroll through the list and identify the device you wish to pair with.

Press  to tick the devices to be paired with then press  to confirm.

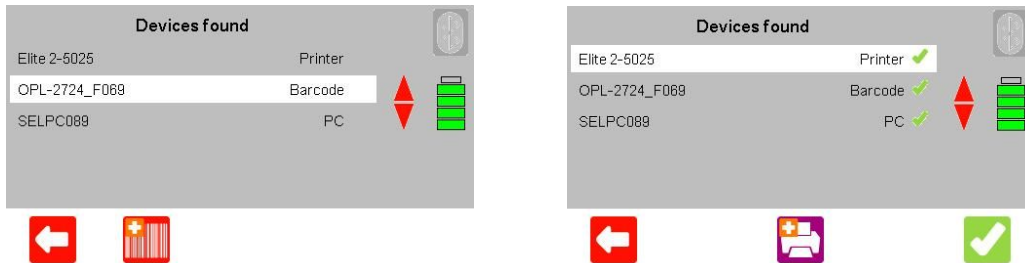


A confirmation message will appear and your paired device will appear in the Bluetooth pairing menu.

Press  to confirm and exit.

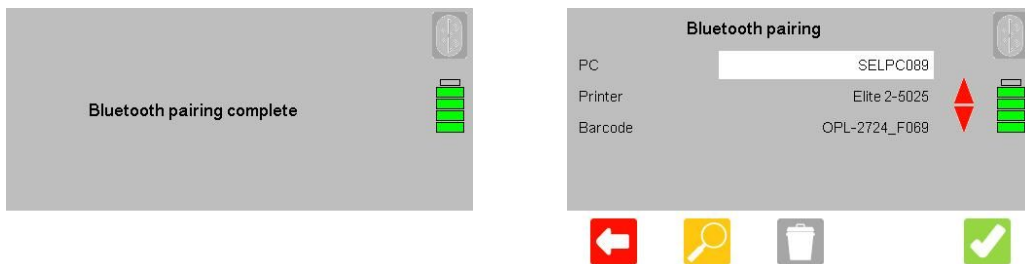
9.3. Connecting to the Bluetooth Barcode Scanner

Ensure the Bluetooth Barcode Scanner is switched on and is discoverable. Consult the user manual for this device for instructions.



A list of available Bluetooth devices will be displayed once searching is complete. Use the **Up/Down** arrow keys to scroll through the list and identify the device you wish to pair with.

Press  to tick the devices to be paired with then press  to confirm.



A confirmation message will appear and your paired device will appear in the Bluetooth pairing menu.

Press  to confirm and exit.

10. Environmental Conditions

The Rigel Uni-Pulse has been designed to perform tests and measurements in a dry environment.

Maximum barometric elevation for making measurements is 2000m.

Protective system IP40 according to IEC 60529.

Electromagnetic compatibility (EMC). Interference immunity and emitted interference conforming to IEC 61326-1.

Operating temperature range of 0°C to +40°C, without moisture condensation.

The Uni-Pulse can be stored at any temperature in the range -15°C to +60°C (relative humidity up to 90%).

Operating altitude 0 to 2000m.

11. Maintaining the Rigel Uni-Pulse

11.1. Cleaning

Clean the external case of the Rigel Uni-Pulse with a clean dry cloth. Avoid using solvents and abrasive scouring agents to clean the external case of the Rigel Uni-Pulse.

Do not allow liquid inside the Rigel Uni-Pulse or near the sockets. Do not use abrasives, solvents or alcohol.

If the Uni-Pulse is subject to liquid ingress, the unit should be returned for repair, stating clearly the cause for repair.

11.2. User Maintenance

The Rigel Uni-Pulse is a rugged quality instrument. However, care should always be taken when using, transporting and storing this type of equipment. Failure to treat the product with care will reduce both the life of the instrument and its reliability.

Always check the Uni-Pulse and all accessories for damage and signs of wear before use.

Do not attempt to open the Uni-Pulse. Maintenance should only be performed by authorised personnel.

The Uni-Pulse contains no user serviceable parts.

Keep the Uni-Pulse and accessories clean and dry.

The recommended calibration period for this unit is 12 months.

11.3. Return Instructions

For repair or calibration of the Uni-Pulse, please contact Calibration House.

Calibration House
11 Bracken Hill
Southwest Industrial Estate
Peterlee
County Durham
SR8 2LS

Tel: +44 (0)191 587 8739
Fax: +44 (0)191 518 4666

Email: info@calibrationhouse.com

Prior to returning your unit, please contact Calibration House to obtain a RMA.

By obtaining a RMA, your service request can be booked in advance allowing for a quicker turnaround time of your equipment.

Please have your instrument **make**, **model** and **serial number** available.

12. Accessories

12.1. Standard Contents

Uni-Pulse defibrillator analyser unit
Sling style carry case
AC power supply
ECG snap adaptors
Uni-Pulse quick start guide
USB bluetooth adaptor
Calibration certificate

12.2. Optional Accessories

386A950 - Paddle adaptor box
386A951 - Variable load adaptor box
339A970 - Test 'n' Tag Elite mobile bluetooth printer
339A923 - Bluetooth barcode scanner

12.3. Replacement Spare Parts

298A678 - ECG snap adaptors (pack of 10)
386A011 - AC power supply
386A008 - Battery pack 9.6V/2400mAh
386W507 - Paddle adaptor box lead (Red)
386W508 - Paddle adaptor box lead (Black)
43B759 - 4mm socket link for use with variable load adaptor box

13. Specifications

13.1. Technical Specifications

Energy Measurement

Load Resistance	50Ω ± 1% non-inductive
Range (Low)	0 - 199.9 Joules
Resolution	0.1 Joules
Accuracy	± 1% of reading ± 0.1 Joule
Range (High)	200 - 600 Joules
Accuracy	± 1% of reading ± 1 Joule
Voltage	0 - 6000 Volts
Current	0 - 120 Amps
Sampling Rate	100 kHz sampling frequency

Cardioversion (Synchronisation) Time

Measurement	From peak of the simulated ECG R-wave to the peak of the defibrillator output pulse.
Range	-250 to +250ms
Accuracy	1% of full scale ± 1ms

Charge Time

Measurement is initiated by pressing the function key and simultaneously charging the defibrillator. Charge time is recorded after the defibrillator has discharged across the 50Ω load.

Discharge Waveform Output

Stored	Waveform is captured onscreen and stored in memory for download/print.
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ECG Arrhythmia Simulator

ECG full 12-lead simulation including hi-level output.

Waveforms

Normal Sinus Rhythm (NSR)	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV
ST Elevation	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV
ST Depression	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV
Myocardial Infarction	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV

Arrhythmia Waveforms - Ventricular

Premature Ventricular Contraction - Intermittent (PVC)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Premature Ventricular Contraction - Continuous (PVCC)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Bigeminy (BIG)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Trigeminy (TRIG)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Ventricular Flutter (VFLT)	240 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Ventricular Fibrillation - Coarse (VFBC)	240 BPM Fixed; Pulse amplitude fixed
Ventricular Fibrillation - Fine (VFBF)	240 BPM Fixed; Pulse amplitude fixed
Monomorphic Ventricular Tachycardia (MVT)	210 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Polymorphic Ventricular Tachycardia (PVT)	240 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Right-focal Premature Ventricular Contraction (RFPVC)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV

Arrhythmia Waveforms - Atrial Conduction

First Degree AV Block (FAVB)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Second Degree AV Block - Mobitz I (SAVB_MI)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Second Degree AV Block - Mobitz II (SAVB_MII)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Third Degree AV Block	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Right Bundle Branch Block (RBB)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Left Bundle Branch Block (LBB)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Left Anterior Hemiblock (LAH)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV

Arrhythmia Waveforms - Atrial

Sinus Arrhythmia (SAR)	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV
Missing Beat (MB)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Atrial Flutter (AFLT)	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV
Atrial Fibrillation (AFB)	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV
Paroxysmal Atrial Tachycardia (PAT)	180 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV
Junctional Premature Contraction (JPC)	80 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV

Performance Waveforms

Sine	0.1 - 100Hz; Pulse amplitude 0.5, 1, 2, 5mV
Square	0.1 - 100Hz; Pulse amplitude 0.5, 1, 2, 5mV
Triangle	0.1 - 100Hz; Pulse amplitude 0.5, 1, 2, 5mV
Pulse	0.1 - 100Hz; Pulse amplitude 0.5, 1, 2, 5mV

Pacer Waveforms

Synchronous Atrial	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV; Pulse width 0.1 - 2ms
Asynchronous Atrial	20 - 300 BPM; Pulse amplitude 0.5, 1, 2, 5mV; Pulse width 0.1 - 2ms
Pacer 60 BPM	60 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV; Pulse width 0.1 - 2ms
Ventricular Pacer 70 BPM	70 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV; Pulse width 0.1 - 2ms
Atrial Pacer 70 BPM	70 BPM Fixed BPM; Pulse amplitude 0.5, 1, 2, 5mV; Pulse width 0.1 - 2ms
R-wave Detection 70 BPM	70 BPM Fixed; Pulse amplitude 0.5, 1, 2, 5mV; Pulse width 0.1 - 2ms

Waveform Output

Low Level	12-lead ECG and on Paddles
Hi Level	Output Jack

Accuracy

Rate	± 1%
Amplitude	± 2% (LA-LL), ± 10% (Paddles)

13.2. General Specifications

Dimensions	220mm x 150mm x 90mm (L x W x H)
Weight	1.5kg
Operation	12V/2400mAh Nickel Metal Hydride battery pack
Mains Supply	110/230V AC; 48 to 66Hz, 35VA power supply
Storage Environment	-15°C to +60°C
Operating Conditions	0°C to +40°C
Environmental Protection	IP 40
Communication	Bluetooth and USB
Display	LCD colour graphic display 1/4" VGA
Memory	1000 test results including graphs

14. Support

14.1. Contact Us

Sales and Delivery enquiries

Tel: +44 (0) 191 587 8730

Fax: +44 (0) 191 586 0227

Email: sales@rigelmedical.com

Technical enquiries

Tel: +44 (0) 191 587 8701

Email: support@rigelmedical.com

Service, Calibration and Repair

Tel: +44 (0) 191 587 8739

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